

*Amendments to the Claims*

The listing of claims will replace all prior versions, and listings of claims in the application.

1. (Currently Amended) A modulation method for multiple-tone signalling, including the steps of:

processing input data through a plurality of intermediate processing stages and corresponding stages of intermediate data to generate preprocessed data;

inverse Fourier transforming the preprocessed data to obtain a symbol including a number of tones;

buffering the symbol in a symbol buffer;

determining <sup>a</sup>the peak amplitude in the symbol and comparing the peak amplitude with a threshold;

if the peak amplitude in the ~~buffered~~ symbol exceeds the threshold, obtaining a regenerated symbol by amending predetermined intermediate data such that the input data is still represented by the intermediate data, carrying out ~~[[the]]~~ subsequent intermediate processing stages on the amended intermediate data to regenerate preprocessed data, ~~[[and]]~~ inverse Fourier transforming the regenerated preprocessed data to obtain the regenerated symbol, and replacing the buffered symbol with the regenerated symbol; and

outputting the ~~buffered~~ contents of the symbol buffer.

2. (Currently Amended) A method according to claim 1 including, when ~~[[a]]~~ the regenerated symbol is generated, comparing the peak amplitude in the

regenerated symbol with the peak amplitude in the buffered symbol and replacing the buffered symbol with the regenerated symbol only if the regenerated symbol has a lower peak amplitude.

3. (Currently Amended) A method according to claim 1 including checking if the peak amplitude in the regenerated symbol exceeds the threshold, and if the ~~predetermined~~ peak amplitude exceeds the threshold, obtaining at least one further regenerated symbol by further amending predetermined intermediate data such that the input data is still represented by the intermediate data, carrying out the subsequent intermediate processing stages on the amended intermediate data to regenerate preprocessed data, inverse Fourier transforming the regenerated preprocessed data to obtain the further regenerated symbol, and replacing the ~~buffered contents of the~~ symbol buffer with the further regenerated symbol.

4. (Original) A method according to claim 1 including determining whether there is sufficient processing time to regenerate a symbol before regenerating that symbol.

5. (Original) A method according to claim 1 wherein the subsequent intermediate processing stages used to regenerate <sup>the</sup> preprocessed data include a scrambling stage.

6. (Currently Amended) A method according to claim 5 wherein the scrambling stage is a self scrambling stage in which an internal memory of previous outputs feeds into ~~[[the]]~~ computation of subsequent outputs in a recursive manner.

7. (Currently Amended) A method according to claim 1 wherein the ~~[[said]]~~ subsequent intermediate processing stages used to regenerate ~~a symbol~~ <sup>the preprocessed data</sup> include a Reed-Solomon error protection stage.

8. (Currently Amended) A method according to claim 1 wherein the ~~[[said]]~~ subsequent intermediate processing stages used to regenerate ~~a symbol~~ <sup>the preprocessed data</sup> include a trellis encoding stage.

9. (Currently Amended) A method according to claim 1 wherein the intermediate data includes a series of data frames including fast bytes ~~[[and/]]~~ or sync bytes and the step of amending the predetermined intermediate data includes amending the fast or sync bytes of the data frames.

10. (Currently Amended) A method according to claim 9 wherein the predetermined intermediate data includes ~~fast~~ <sup>the</sup> bytes or sync bytes having default values with at least one freely selectable bit and the step of amending the predetermined intermediate data includes amending the at least one freely selectable bit of the fast or sync bytes having default values.

11. (Original) A method according to claim 1 wherein the predetermined intermediate data includes idle cells and the step of amending the predetermined intermediate data includes amending at least one idle cell.

12. (Currently Amended) A method according to claim 11 wherein the step of amending the at least one idle cell includes selecting, for at least one payload byte in said at least one idle cell, an alternative idle cell payload byte value from a predetermined set of idle cell payload byte values, the number of values in said predetermined set being much less than the total number of possible idle cell payload byte values.

13. (Original) A method according to claim 1 wherein the step of amending the predetermined intermediate data includes replacing ATM cells one with the other.

14. (Original) A method according to claim 13 wherein the step of amending the predetermined intermediate data includes replacing an idle ATM cell with a new data ATM cell.

15. (Original) A method according to claim 13 wherein the step of amending the predetermined intermediate data includes swapping two ATM cells from different data streams.

16. (Original) A method according to claim 13 wherein the step of amending the predetermined intermediate data includes replacing a <sup>ATM</sup>data<sub>^</sub> cell with an <sup>ATM</sup>idle<sub>^</sub> cell.

17. (Currently Amended) A modulation method for multiple-tone signalling, including the steps of:

processing input data through a plurality of intermediate processing stages and corresponding stages of intermediate data to generate preprocessed data;

<sup>inverse Fourier</sup>  
transforming the preprocessed data to obtain a symbol including a number of tones; and

<sup>a</sup>  
if ~~the~~ peak amplitude in the symbol exceeds a predetermined threshold, regenerating the symbol by amending predetermined intermediate data such that the

input data is still represented by the intermediate data, ~~and~~ carrying out [[the]].

*on the amended intermediate data to regenerate preprocessed data, inverse subsequent intermediate processing stages, and the transforming step on the amended Fourier transforming the regenerated preprocessed data to obtain a regenerated symbol, intermediate data, and replacing the symbol with the regenerated symbol.*

18. (Currently Amended) A modulation method for multiple-tone signalling, including the steps of:

processing input data through a plurality of intermediate processing stages and corresponding stages of intermediate data to generate preprocessed data;

<sup>inverse Fourier</sup>  
transforming the preprocessed data to obtain a symbol including a number of tones;

buffering the symbol;

<sup>a</sup>  
if ~~the~~ peak amplitude in the symbol exceeds a predetermined threshold, amending predetermined intermediate data such that the input data is still represented by the

*on the amended intermediate data to regenerate preprocessed data,*  
intermediate data, ~~and~~ carrying out [[the]] subsequent intermediate processing stages ~~and~~

*inverse Fourier Transforming the regenerated preprocessed*  
~~the transforming step on the amended intermediate~~ data to obtain a regenerated symbol,  
and

replacing the buffered symbol with the regenerated symbol if a predetermined condition applies.

19. (Original) A method according to claim 18 wherein the predetermined condition is that the peak amplitude in the regenerated symbol is less than that of the buffered symbol.

20. (Currently Amended) A computer program product for causing a data processor to carry out the steps of:

processing input data through a plurality of intermediate processing stages and corresponding stages of intermediate data to generate preprocessed data;

inverse Fourier transforming the preprocessed data to obtain a symbol including a number of tones;

buffering the symbol in a symbol buffer;

determining<sup>9</sup> ~~the~~ peak amplitude in the buffered symbol and comparing the peak amplitude with a threshold;

if the peak amplitude in the ~~buffered~~ symbol exceeds the threshold, obtaining a regenerated symbol by amending predetermined intermediate data such that the input data is still represented by the intermediate data, carrying out ~~the~~ subsequent intermediate processing stages on the amended intermediate data to regenerate preprocessed data, [[and]] inverse Fourier transforming the regenerated preprocessed

data to obtain the regenerated symbol, and replacing the buffered symbol with the regenerated symbol; and

outputting the ~~buffered~~ contents of the symbol buffer.

21. (Currently Amended) A computer program product according to claim 20 ~~for carrying out the steps of comparing~~ including, when ~~[[a]]the~~ regenerated symbol is generated, comparing the peak amplitude in the regenerated symbol with the peak amplitude in the buffered symbol and replacing the buffered symbol with the regenerated symbol only if the regenerated symbol has a lower peak amplitude.

22. (Currently Amended) A computer program product according to claim 20 ~~for carrying out the step of~~ including checking if the peak amplitude in the regenerated symbol exceeds the threshold, and if the ~~predetermined~~ peak <sup>in the regenerated symbol</sup> amplitude exceeds the threshold, obtaining at least one further regenerated symbol by further amending predetermined intermediate data such that the input data is still represented by the intermediate data, carrying out the subsequent intermediate processing stages on the amended intermediate data to regenerate preprocessed data, inverse Fourier transforming the regenerated preprocessed data to obtain the further regenerated symbol, and replacing the ~~buffered contents of the~~ symbol buffer with the further regenerated symbol.

23. (Original) A computer program according to claim 20 wherein the subsequent intermediate processing stages used to regenerate <sup>the</sup> preprocessed data include a scrambling stage.

24. (Currently Amended) A transmitter for transmitting multiple tones representing input data, comprising:

a processor for generating preprocessed data from the input data through a series of intermediate processing stages, intermediate data being transmitted between ~~each pair~~ of each of the intermediate processing stages;

an inverse Fourier transform module for carrying out an inverse Fourier transform on the preprocessed data to obtain a symbol including a number of tones;

a buffer for storing the symbol;

a peak detector for detecting <sup>a</sup>the peak amplitude in the symbol and comparing the peak amplitude with a threshold;

~~and~~ a regeneration control system for ~~causing the processor, if the peak amplitude in the symbol exceeds the threshold, to carry out the steps of:~~ amending predetermined intermediate data such that the input data is still represented by the intermediate data<sup>a</sup>[[;]], regenerating the preprocessed data by executing <sup>a</sup>[[the]] subsequent intermediate processing stages on the ~~regenerated~~ amended intermediate data<sup>a</sup>[[;]], inverse Fourier transforming the regenerated preprocessed data to obtain a regenerated symbol including a number of tones<sup>a</sup>[[;]], and replacing the symbol stored in the buffer with the regenerated symbol, if the peak amplitude in the symbol exceeds the threshold; and

a digital to analogue converter for converting the symbol stored in the buffer to an analogue signal having multiple tones.



25. (Currently Amended) A modulator for a multi-tone transmission system

including:

a processor having a plurality of intermediate processing stages for processing input data through <sup>corresponding</sup> stages of intermediate data to generate preprocessed data;

a transform unit for <sup>inverse Fourier</sup> transforming the preprocessed data to obtain a symbol

including a number of tones; and

a regeneration control unit for regenerating the symbol if <sup>a</sup> the peak amplitude of the symbol exceeds a predetermined threshold, by amending predetermined intermediate data such that the input data is still represented by the intermediate data, and carrying out <sup>on the amended intermediate data to regenerate preprocessed data, inverse</sup> [[the]] subsequent intermediate processing stages and <sup>transforming</sup> [[the]] transforming <sup>[[step on]]</sup> the ~~Fourier transforming the regenerated preprocessed data to obtain a regenerated symbol, amended intermediate data,~~ and replacing the symbol with the regenerated symbol.

26. (Currently Amended) A multi-tone modem including:

a processor having a plurality of intermediate processing stages for processing input data through <sup>corresponding</sup> stages of intermediate data to generate preprocessed data;

a transform unit for <sup>inverse Fourier</sup> transforming the preprocessed data to obtain a symbol data

stream ~~of symbols~~ including a number of tones;

a buffer for storing <sup>a symbol</sup> the symbols of the symbol data stream;

a regeneration control unit for regenerating a symbol of the symbol data stream only if <sup>a</sup> the peak amplitude of the <sup>stored</sup> [[said]] symbol exceeds a predetermined threshold, by

amending predetermined intermediate data such that the input data is still represented by <sup>on the amended intermediate data to regenerate preprocessed data,</sup> the intermediate data, carrying out [[the]] subsequent intermediate processing stages and

*inverse Fourier transforming the regenerated preprocessed*  
[[the]] ~~transforming~~ <sup>transforming</sup> ~~[[step on]] the amended intermediate~~ data, and replacing the ~~[[said]]~~  
symbol in the buffer with the regenerated symbol; and  
a line driver for outputting the ~~symbol~~ <sup>symbol</sup> stored in the buffer down a transmission  
line.

27. (Currently Amended) A multi-tone transmission system, including  
a transmitter for transmitting multiple tones representing input data, comprising:  
a processor for generating preprocessed data from the input data through a series  
of intermediate processing stages, intermediate data being transmitted between each pair  
of each of the intermediate processing stages;  
an inverse Fourier transform module for carrying out an inverse Fourier  
transform on the preprocessed data to obtain a symbol including a number of tones;  
a buffer for storing the symbol;  
a peak detector for detecting <sup>a</sup> the peak amplitude in the symbol and comparing the  
peak amplitude with a threshold;  
~~and a regeneration control system for causing the processor, if the peak amplitude~~  
~~in the symbol exceeds the threshold, to carry out the steps of:~~ amending predetermined  
intermediate data such that the input data is still represented by the intermediate data~~[[;]],~~  
regenerating the preprocessed data by executing ~~[[the]]~~ subsequent intermediate  
processing stages on the regenerated data~~[[;]],~~ inverse Fourier transforming the  
regenerated preprocessed data to obtain a regenerated symbol including a number of  
tones~~[[;]],~~ and replacing the symbol stored in the buffer with the regenerated symbol, if  
the peak amplitude in the symbol exceeds the threshold;

a digital to analogue converter for converting the symbol stored in the buffer to  
an analogue signal having multiple tones;

a transmission line connected to the output of the digital to analogue converter for  
transmitting the analogue signal; and

a receiver connected to the other end of the transmission line to the transmitter  
for receiving and decoding the analogue signal transmitted down the transmission line  
from the transmitter.